

The Prosodic Encoding of Focus in Lujiang Dialect

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Abstract. The focus is the component highlighted in the sentence, which can be broadly divided into broad focus and narrow focus. Prosodic encoding of focus can be reflected on pitch, duration and intensity. Different languages and dialects show different characteristics. This paper takes Lujiang dialect in Anhui Province as the research object, and discusses the prosodic encoding of focus in different tones with wide focus and narrow focus. The results show that the prosodic encoding of focus in Lujiang dialect is reflected in pitch, duration and intensity.

1. Introduction

The focus in the field of linguistics, firstly proposed by Mathesius of the Prague School in 1929[1], is still one of the hot topics in linguistics. The focus can be divided into wide focus and narrow focus. Wide focus means that the whole sentence is the focus, which is usually used for answering “what's wrong?”, “what happened?”, while narrow focus is to answer “who?”, “where?”.

It is known that the focus is often highlighted by sentence stress, but its specific prosodic encoding is still worth studying. First of all, the definition of stress should be clear. The most popular definition is that the syllable with the most prominent sense of hearing is the stress[2]. There are different opinions. Zhao(1979)[3] argued that stress is characterized by widening of the pitch range and elongation of the duration, followed by strengthening of the airflow; Lin (1990)[4] thought that the stress lies mainly in pitch, duration and intensity; Cao(2002)[5] pointed out that stress is comprehensive enhancement of four prosodic elements: the duration of the sound is significantly longer, the pitch increases, the intensity enhances and the timbre is more typical. It can be seen that pitch and duration are the most important prosodic elements. The results of numerous acoustic experiments on focus including English[6], Japanese[7], and Korean[8], prove that the pitch is raised on the focus, and compressed after the focus, which is named as PFC (post-focus Compression)[9]. It is worth mentioning that not all languages have PFC, such as Yi[10], Vietnamese[11].

Since Chinese is a tone language and the tone systems of dialects are more complex, the pitch variation in actual speech is disturbed and restricted by the acoustic effects of tone and intonation. Chinese Mandarin has been proved that it has PFC[9]. Some dialects are known to have no PFC, such as Minnan [12], Cantonese [13], while some dialects have appeared significant PFC, such as Wu Suzhou dialect, Changzhou dialect, etc.[14]. Dialects with PFC may also have different ways of realizing PFC, such as Shandong dialect [15].

This paper takes Lujiang dialect of Jianghuai Mandarin as the research object, and studies the pitch with different tones, also investigates the variation of duration and intensity. Lujiang is a county of Hefei City, Anhui Province, with a total area of about 2,348 square kilometers and 1.193 million residents [16]. According to Zhou (2001) [18] and the author's previous field work, Lujiang dialect has 25 initials, 49 finals and 6 tones including 55, 31, 213, 35, 5, 3. This paper chooses the first four tones as the experimental materials.

2. Method

2.1 Material

As mentioned earlier, in order to study the variation of pitch in the focus position, we need to consider the situation of tone combination, that is, to control the tonal combination of focus word

itself and the whole sentence. The experimental material used in this paper is a seven - syllable statement sentence. Except for the change of disyllabic focus words, the rest of the syllables are the Yin Ping Tone(value=55). The IPA symbols with the meanings of sentences are shown in Table 1 and the focus words are underlined.

Table 1 The experimental materials

NO	TONE	NAME
1	55	kɛ kə <u>kæn ku</u> fi təŋ tɛin
	+	Today <u>my sworn brother</u> is flying to Tokyo.
	55	
2	31	kɛ kə <u>tʰaŋ ɿ</u> fi təŋ tɛin
	+	Today <u>my aunt</u> is flying to Tokyo.
	31	
3	213	kɛ kə <u>pɿɔ tsɿ</u> fi təŋ tɛin
	(actual value=24)	Today <u>my cousin</u> is flying to Tokyo.
	+213	
4	35	kɛ kə <u>ta mei</u> fi təŋ tɛin
	+	Today <u>my sister</u> is flying to Tokyo.
	35	

In order to analyze the variation of pitch of the two condition, we need to compare the phonetic parameters under the conditions of wide and narrow focus. We designed two kinds of leading questions, including "What happened?" set for the wide focus condition and "Who flies to Tokyo today?" set for the narrow focus condition.

2.2 Subjects and Recording

As shown in Table 2, eight speakers aged 18-30 were selected for the experiment. These four men and four women, native to Lujiang, are fluent in Lujiang dialect and have no speech disorder. All the subjects did not know the purpose of the experiment.

Table 2 The Subjects

NO	NAME	AGE	GENDER
1	SZ	18	Female
2	HYQ	19	Male
3	WK	21	Female
4	XWD	20	Male
5	WM	25	Female
6	ZQ	26	Male
7	LS	30	Female
8	SLL	28	Male

The recording took place in the quiet environment, with a laptop, Sony recording headset, and an Adobe Audition3.0 sound processing software.

Firstly, the experimental materials were presented in random order on the computer screen. After playing the leading question, the speaker would be asked to answer the questions completely according to the material presented.

2.3 Data Analysis

After pre-processing, the recordings are imported into Praat software for material segmentation and annotation. Then the phonetic parameters of the signal are calculated by Matlab software.

- (1) Pitch: auto-correlation algorithm is used to calculate the fundamental frequency of the speech signal, in which ten fundamental frequency points are extracted equidistantly from each sentence, and then the outliers are checked. The obtained fundamental frequency (f0) is converted to the semitone f with 50Hz as the reference value, and the conversion formula is:
$$f=12*\log_2 (f0/50); \tag{1}$$
- (2) Duration: the result is obtained according to the Praat software and recorded in milliseconds (ms);

- (3) Intensity: the amplitude (A0) curve of the speech signal is calculated according to the Praat software and the reference value is 50 decibels (dB), and the conversion formula is:

$$A=12*\log_2 (A0/50). \quad (2)$$

3. Results

3.1 Pitch

Pitch is known as an important parameter of focus realization, and the sentences are divided into three paragraphs: focus / pre-focus / post-focus. The pitch curves of the four experimental sentences after normalization are shown in Fig. 1. The horizontal axis is time corresponding to the three segments of the sentence, and the vertical axis is the semitone value converted from the fundamental frequency F0. The solid line is wide focus and the dotted line is narrow focus.

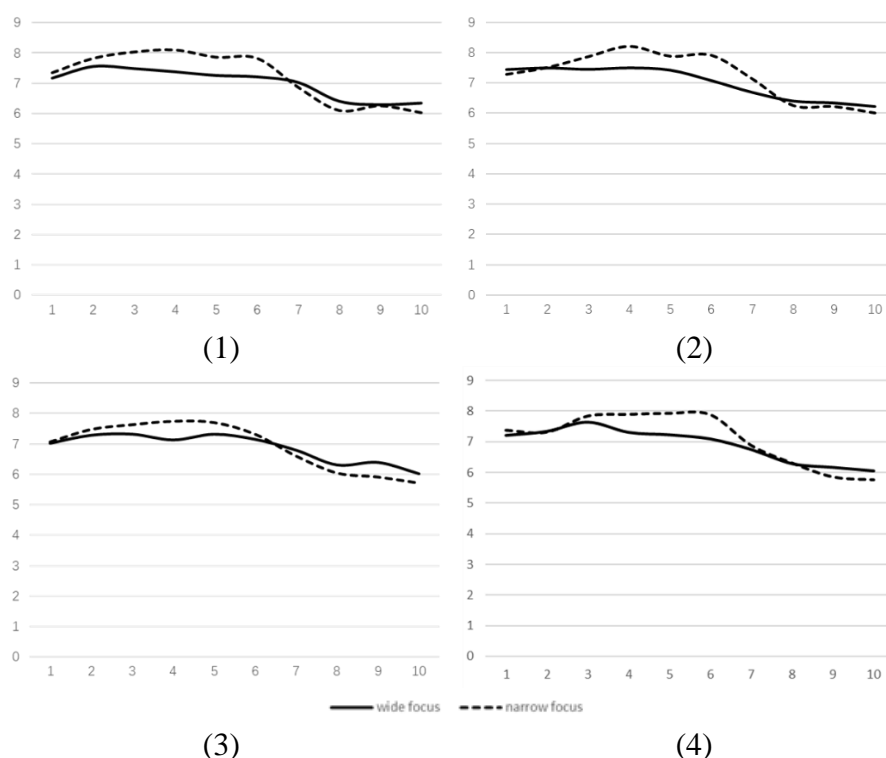


Fig. 1 Pitch contours of sentences

It can be seen that the characteristics of the three sections are : (1) the pitch at the focus position is significantly higher, (2) the pitch before the focus has no significant variation, (3) the pitch drops after the focus.

3.2 Duration

In this part, the sentences are divided into four parts: focus / pause before focus / pre-focus / post-focus. As shown in Fig. 2, the vertical axis is four sections, the horizontal axis is the mean length of the corresponding time in millisecond. The dark square at the top represents the wide focus, while the other is the narrow focus.

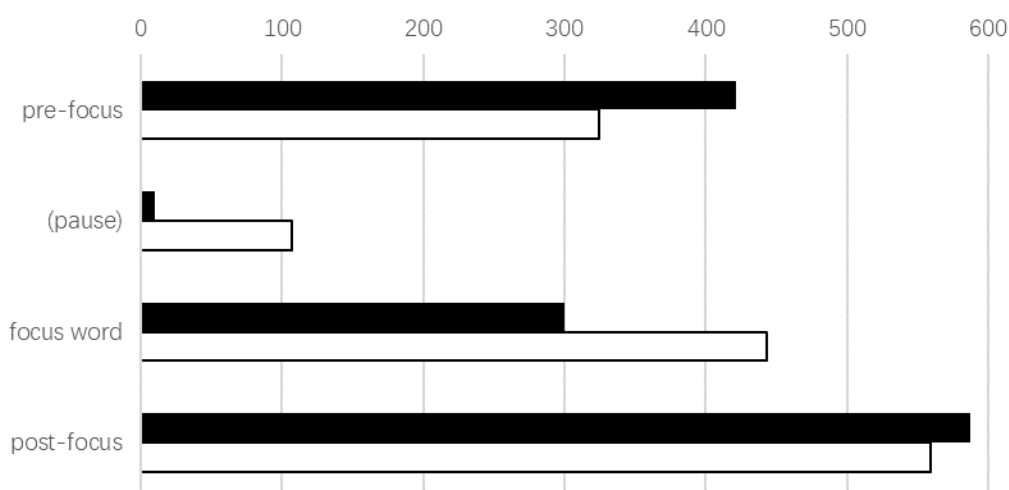


Fig. 2 Mean durations of sentences

We can find that the post-focus part of the narrow focus sentences is slightly shorter and the pause before the focus is obviously longer than the corresponding part of the wide ones, which can be seen as the compression of focus on the post-focus syllable's duration.

3.3 Intensity

As shown in fig. 3, the horizontal axis is time and the vertical axis is mean intensity with the value of 50 db as the reference value. The solid line is the wide focus, and the dotted line is the narrow focus.

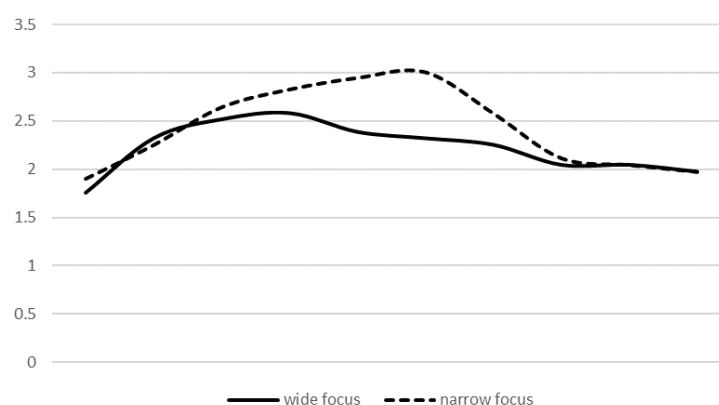


Fig. 3 Mean intensity contour of sentences

The data of sentence intensity distribution shows that only the intensity of focus has a significant difference, namely narrow focus higher than wide focus. Focus has no obvious effect on the intensity of the pre-and pro-focus segments, but only increase the intensity of the focus.

4. Conclusion

Starting from the sentences with wide and narrow focus, this paper discusses in detail the focus in Lujiang dialect from the perspective of pitch, duration and intensity. Based on the experimental data, the prosodic encoding characteristics of Lujiang dialect focus can be concluded as follows :

- (1) The pitch and intensity before the focus are not affected; the duration is obviously elongated.
- (2) The pitch and intensity at the focus increase significantly; also the length is elongated, and it is notable that there is a short pause between the focus and the pre-focus segment.
- (3) PFC occurs when the pitch of the pro-focus is obviously compressed. There is no obvious change in intensity and a slight shortening of the sound duration. Further research is needed to determine whether there is a compression effect.

The results of this study show that the focus of Lujiang dialect calls for three prosodic elements: pitch, duration and intensity. The relevant conclusions drawn in this paper need to be verified in other similar dialects.

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